

70. (New) The process according to claim 65, wherein said one or more molecules includes CH_3SiCl_3 .

71. (New) The process according to claim 65, wherein said solution additionally contains one or more molecules of the formula R_3SiX_2 , wherein R is as defined above and X is a halogen, an alkoxy group, an aryloxy group or a benzyloxy group.—

REMARKS:

Upon entry of this Amendment, Claims 1- 45 will have been cancelled, new Claims 46-71 will have been added and Claims 46-71 will be pending. **Attachment A** of this Amendment includes certain pages to the original specification which have been marked-up with deleted text shown between brackets and added text being underlined. No new matter has been introduced by this Amendment. Entry and reconsideration are respectfully requested.

ELECTION/RESTRICTIONS:

The Examiner has required restriction under 35 U.S.C. § 121, and applicant's representative Gregory Friedlander, provisionally elected with oral traverse, on October 2, 2001, to prosecute the invention of Group I, claims 1-32 and 34-45. Claim 34 therefore stands withdrawn as being directed to the non-elected invention. Applicant reserves the right to file a divisional application for the non-elected invention.

Applicant's representative also designated RXaXb3 the specie to be examined. Claims 1-2, 17-20, 25-28 and 34-45 have been indicated by the examiner to be the claims which read on the

elected specie. By this amendment, claims 1-45 have been canceled. Newly added independent claims 46 and 64 are generic claims by reciting both $RXaXb_3$ and R_3XaXb . As applicant has elected $RXaXb_3$ as the specie to be examined, newly added claims 46-57, 59-68 and 70-71 correspond to the elected specie. The newly added claims are readable on the elected species, as indicated above, and in compliance with the requirements of MPEP § 809.02(a).

Applicant hereby affirms this election with traverse. Applicant respectfully submits that the election of specie requirement is improper since searching both species $RXaXb_3$ and R_3XaXb would not be a burden to the PTO. Applicant requests that the restriction and election requirements be withdrawn.

RESPONSE TO REJECTION UNDER 35 U.S.C. § 112, SECOND PARAGRAPH:

Claims 1-2, 17-20, 22, 25-28 and 34-45 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1-2, 17-20, 22, 25-28 and 34-45 have been canceled and replaced by new claims 46-71. Applicant respectfully submits that the existing rejection under 35 USC § 112, 2nd ¶ is moot, and not applicable to the new claims set forth above.

RESPONSE TO THE OBJECTION TO THE SPECIFICATION:

The Examiner has objected to the Specification as containing several informalities. Applicant respectfully submits that in view of the above amendments, this objection is no longer applicable and should be withdrawn. Marked up original sections showing the amendments are included in

ATTACHMENT A.

RESPONSE TO THE OBJECTION TO THE DRAWINGS:

The drawings have been objected to as “it is not clear what is Figure 6, 6a and 6b.”

Correction has been made to the specification. Applicant submits herewith corrected drawings for Figures 6a, 6b and 6c for the Examiner’s approval. The Examiner is requested to hold in abeyance the requirement for formal drawings until the claims are in condition for allowance.

RESPONSE TO REJECTIONS UNDER 35 U.S.C. § 102:

SUMMARY:

The prior art relied upon and cited by the Examiner exemplify different methods of creating solutions (oxygenated polymers, such as, SiO₂) which require supplemental heat or some other destabilizing energy to infuse a resin into the wood. In contrast, applicant’s claimed invention specifies that the treating material be exothermic reacted with the hydroxyl groups of the wood, and therefore is an exothermic process for treating wood, which avoids the need for the endothermic energy in the prior art processes.

1. Saka

Claims 1-2 and 17-18 have been rejected under 35 U.S.C. § 102(b) as being anticipated by the teaching of Saka et al., Wood Sci. Technol (WST)(“the Saka publication). Applicant respectfully traverses this rejection.

The Examiner states “Saka teaches application of MTMOS and HFOETMOS into moisture conditioned wood, to give fire resistant wood, which resists leaching of the agents...” The Saka publication only discloses the absorption of SiO₂ from pre-prepared solutions of methyltrimethoxysilane (MTMOS) and 2-heptadecafluorooctylethyltrimethoxysilane (HFOETMOS)

which are applied under reduced atmospheric pressure and heated for an extensive amount of time (page 459, last paragraph under "Preparation of wood-inorganic composites"). However, Saka does not expressly disclose a process involving an exothermic polymerization reaction with cellulose or the addition of applicant's compounds (defined by the formulae $R-Xa-Xb_3$ or $R_3-Xa-Xb$). Thus the method described in the Saka publication is distinctly different from the invention presently claimed, and would appear to teach away from the claimed invention because Saka expressly adds heat. Applicant respectfully submits that the rejection under 35 USC § 102 is improper and should be withdrawn.

2. *U.S. Patent No. 5,652,026 (SAKA)*

Claims 1-2, 17-18, 25-28, 34-39, 41 and 43-45 have been rejected as being anticipated by U.S. Patent No. 5,652,026 (the Saka patent). Applicant respectfully traverses this rejection.

The Examiner opines

"'026 teaches impregnating moisture conditioned (4:62) wood, using vacuum or pressure (4:61-68), with a methyltrialkoxysilane, boric acid (4:29-68), acid or base catalysts or a catalysts that can produce an acid such as metal organic acid salt (5:1-15), after which it is cured with heat (see the examples). The wood is made flame retardant, and the silicon material is fixed within the wood, and is not leachable . . ."

The Saka '026 patent discloses a method that involves impregnating methylsilicone resins (abstract) into the cavities in the wood cell walls (4:27-28), in which the oligomer may be diluted by using a lower alcohol or ketone (4:46-49). From the patent disclosure, it would appear that Saka's silicon material fixes the resins within the wood by absorption. Thus Saka does not molecularly bond these resins to the wood cellulose through cross-linkage to the hydroxyl groups.

In the present invention, applicant reacts compounds defined by the formulae $R-Xa-Xb_3$ or $R_3-Xa-Xb$, wherein "Xb is a halogen, hydroxyl group, an alkoxy group, a phenoxy group, a benzyloxy group or an aryloxy group with a polycyclic aromatic ring." The Saka patent does not appear to disclose these types of compounds. In fact, all the working examples of the Saka patent appear to be limited to, are oligomers which must have a CH_3SiO repeating unit.

The Saka patent requires supplemental heat, whereas applicant's invention involves an exothermic reaction, which is self-propagating, and self-curing. With respect to Saka's catalyst, this catalyst is used to convert the oligomer into a methylsilicone resin (5:4-6), a reaction process which is not contemplated by the instant Application.

Applicant respectfully submits that in view of the above analysis, the rejection is improper and should be withdrawn.

3. U.S. Patent No. 5,073,195 (Cuthbert)

Claims 1-2 and 17-18 have been rejected as being anticipated under 35 USC § 102 by U.S. Patent 5,073,195 (the Cuthbert patent). Applicant respectfully traverses the rejection.

The Examiner opines that the "195 teaches applying an alkyltrialkoxysilane to wood to make it water repellant."

Cuthbert teaches making wood water repellant by treating the surface with an aqueous solution of a water-soluble coupling agent and an alkyltrialoxysilane (Abstract). In contrast, the present invention relates to methods in which the treating agent is applied through an organic solvent. The Cuthbert expressly patent teaches away from using organic solutions. See column 5,

lines 54 - 63) where Cuthbert expressly discloses that a “major” advantage of disclosed process is to avoid the liberation of alcohol.

Applicant respectfully submits that the rejection is improper and should be withdrawn.

4. *Ogiso, et al.*

Claims 1-2, 17, 19 and 27 have been rejected under 35 USC § 102 as being anticipated by the study described in the Ogiso publication. Applicant respectfully traverses this rejection.

The Examiner states that Ogiso “teaches applying alkoxysilane to wood to make it water repellant.” The Ogiso publication describes a study involving ultrasonic radiation treatment used in the preparation of moisture conditioned composites. The ultrasonic radiation allegedly enhances the absorption of the treating agent, i.e., SiO₂ (pp. 302, first paragraph), and the resulting SiO₂ gel formed in the wood. In contrast, in applicant’s claimed invention, the compounds being added are not absorbed for the purpose of forming a gel. As discussed above, applicant’s invention involves an exothermic process in which the claimed molecules react with wood cellulose so they are cross-linked to the wood cellulose through one or more of the hydroxyl groups on the wood cellulose.

Applicant therefore respectfully submits that there is no anticipation, that the rejection is improper and should be withdrawn.

5. *Myers*

Claims 1, 17 and 19 have been rejected under 35 USC § 102 as being anticipated by U.S. Patent No. 3,863,675 (the Myers patent). Applicant respectfully traverses this rejection.

The Myers patent relates to the flame retardency of wood products, and in particular wood panels. The flame retardency is preferably accomplished by immersing the panel to be treated in a hot solution, and in the presence of compressional energy. However, there is apparently no discussion in Myers regarding the mechanism by which the treating agent interacts with the wood panel, except that it is infused. In addition, because Myers is relying upon the addition of supplemental heat and compressional energy it seems unlikely that if any reaction is occurring in the Myers process, that it is exothermic. Thus, Myers does not expressly disclose the claimed exothermic process in which molecules are cross-linked via the hydroxyl groups of the cellulose. Further, the Examiner has provided no technical explanation as to why the heated infusion process disclosed by Myers would be either exothermic or involve replacement of the hydroxyl groups of the cellulose.

Applicant therefore respectfully submits that the rejection is improper and should be withdrawn.

RESPONSE TO REJECTIONS UNDER 35 U.S.C. § 103:

Claim 20 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Saka et al., Wood Sci. Technol., 31(6), pp 457-466, 1997. Claims 20, 40 and 42 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Saka et al., (5652026). Claim 20 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Cuthbert et al. (5073195). Claim 22 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ogiso et al. Claim 22 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Myers (3682675). Applicant respectfully traverses these rejections.

The Examiner relies on the same references applied under 35 USC § 102, in rejecting the claims under 35 USC § 103. Each of the Examiner's obviousness rejections express the belief that it would have been obvious to one of ordinary skill in the art to optimize the cited parameter (concentration of agents in the wood, % of each ingredient, and concentration of agent when it is an important parameter) through routine experimentation. However, none of the references teach or suggest the claimed invention, as defined by the independent claims. None of the references disclose a process that intentionally treats a wood product with molecules that react with wood cellulose so they are cross-linked to the wood cellulose through one or more of the hydroxyl groups on the wood cellulose.

In addition, the Examiner's position is one based on optimization. However "[a] particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation." (MPEP § 2144.05 (II)(B)). Since the prior art does not recognize the displacement of hydroxyl groups on wood cellulose as a function of wood protection, the prior art can not recognize the basis for selecting the parameter concentration for reactive cross-linking with wood cellulose as in the present invention. While it is well understood that "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation" (MPEP 2144.05 (II)(A)), that is not the case here. The process conditions of the claims in the instant application have not been disclosed in the prior art, i.e. the concentration of one or more molecules in the wood defined by the formulae

R-Xa-Xb₃ or R₃-Xa-Xb, wherein R is an alkyl group, Xa is a trivalent, tetravalent or pentavalent atom, and Xb is a halogen, hydroxyl group, an alkoxy group, a phenoxy group, a benzyloxy group or an aryloxy group with a polycyclic aromatic ring.

Thus these parameters are not recognized result-effective variables in the prior art. Applicant therefore respectfully submits that the rejections under 35 U.S.C. § 103 are improper and should be withdrawn.

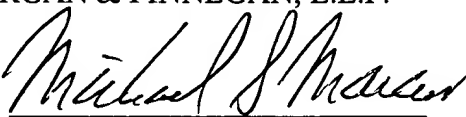
CONCLUSION:

The Applicant respectfully submits that the application is in condition for allowance.

AUTHORIZATION:

The Commissioner is hereby authorized to charge any additional fees which may be required for this response, including all fees pursuant to 37 C.F.R. § 1.17 for its timely consideration, or credit any overpayment to Deposit Account No. 13-4500, Order No. 4355-4001.

Respectfully submitted,
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ATTACHMENT A

IN THE SPECIFICATION

Delete page 10, line 17, to-wit: [by wood treating companies to produce environmentally safe, treated wood and wood products.]

At page 14, line 1, rewrite lines 1-22 commencing with “Figure 1A,” and ending with “where two” as follows:

- - Figure 1a[A], 1b[B], and 1c[C] are alternate views of the structure of the cellulose of wood.

Figure 2 is a view of a chemical process for altering the cellulose structure of wood showing one method of altering the structure of a single strand of cellulose.

Figure 3 shows a generic representation of the formula shown in Figure 2.

Figure 4 shows one [alternate] alternative structural cellulose target.

Figure 5 shows an alternative target for the [structure of treated wood] structural cellulose target.

Figure 6a shows the product generated by the process taught herein [shows a representation of cellulose].

Figure 6b shows an alternative theoretical model for products by the process taught herein [a show one theoretical model for products by the process taught herein].

Figure 6c shows a chain of repeating units of cellulose [6c shows what the inventor thinks is the more likely product generated by the process taught herein].

Figure 7 (a-c) shows the most likely reaction with a silicon donor.

Figure 8 (A-D) shows an alternate embodiment of the invention. Figure 8(B1) and (B2) shows alternative intermediary boron molecules, which may be generated in the process.

Figure 9 shows an alternative mechanism for achieving an alternative to intermediary 8[b]B.

Figure 10 shows the production of an intermediary ([b]B) and a possible reaction using both boron and silicon (A[a]) to guarantee a polymer with silicon and boron in the modified cellulose structure (C[c]).

Figure 11 shows a genuine representation of a reagent with cellulose (A[a]). Here the reagent is generically listed as [R-Si - (X)] R'-Si(X)₃; where X is an [O-R] -OR group [compound] and R [being] is an alkyl group[;], halogen, or a hydroxyl group (OH).

Figure 12 shows a similar reaction to that shown in Figure 11 with a boron molecule substituted for the Silicon molecule. Alternative embodiment are shown as B[1] and [B2]C where two - -

At page 15, line 1, rewrite lines 1-2 commencing with "hydroxyl groups" and ending with "treat wood." as follows:

- - of the hydroxyl groups on the cellulose [which] are replaced.

Figure 13 (A-C) shows a block diagram of a process to treat wood. - -

Amend the paragraph starting on page 18, line 16, and ending on page 15 line 6 with:

- - In order to allow for use of more common reactants, it is envisioned, as shown in Figures 15 and 16, that a catalyst for the reaction could be provided by acids or molecules yielding acids. In this preferred embodiment, the process includes the steps of

- 1) Preparing a solution, preferably in alcohol (methanol or ethanol work well),
- 2) Adding a silicone donor which has one to eight carbon alkyloxy group (methoxy, octyloxy, etc.)
- 3) Adding a strong acid (hydrochloric, phosphoric or sulfuric acid) directly or by way of a catalyst yielding the acid in solution with the water in the wood such as methyl[]trichlorosilane ($\text{CH}_3[3]\text{SiCl}_3[3]$). In the preferred embodiment this is preferably an acid solution of 0.5%, but may range 5% to 0.1%. It may also be outside this range with less certain results since the acidity of the wood is not desirable for most uses.
- 4) Exposing the solution prepared in steps 1-3 to cellulose to allow binding as shown with or without time and pressure restrictions to limit the extent of treatment. - -